TEHAMA COUNTY AIR POLLUTION CONTROL DISTRICT

RULE 4:31 - INDUSTRIAL, INSTITUTIONAL, AND COMMERCIAL BOILERS, STEAM GENERATORS, AND PROCESS HEATERS OXIDES OF NITROGEN CONTROL MEASURE

(Adopted 3/14/1995; Amended 1/29/2002)

A. Purpose: To reduce Oxides of Nitrogen emissions during the operations of Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters.

B. Applicability: With the exception of utility boilers, this rule applies to all boilers, steam generators, and process heaters used in industrial, institutional, and commercial operations that exist within the boundaries of the Tehama County Air Pollution Control District on the date of adoption of this Rule.

C. Exemptions:

1. The requirements of Section E. shall not apply to the units which are willing to accept a permit condition that restricts operation to an annual capacity factor of 15% or less.

2. To continue to qualify for the exemption provided in Section C.1. the owner or operator of any applicable unit(s) shall submit to the Air Pollution Control Officer annual fuel use data that demonstrates that the unit(s) operated at or below the allowable 15% annual capacity factor(s). For the purposes of this Section, the annual capacity factor for multiple units may be calculated based on the total fuel input to multiple like units.

3. Following adoption of this rule, an exemption granted for any unit will become null and void if that unit operates for more than 1 calendar year at an annual capacity factor greater than 15%.

4. The requirements of Section E. shall not apply to units with a rated heat input capacity less than one (1) million BTU's per hour.

D. Definitions: For the purposes of this Section, the following definitions shall apply.

1. Annual Capacity Factor: The ratio of the amount of fuel burned by a boiler in a calendar year to the amount of fuel it could have burned if it had operated at the rated heat input capacity for 100 percent of the time during the calendar year.

2. Boiler or Steam Generator: An individual piece of combustion equipment fired with liquid, gaseous, or solid fuel with the primary purpose of producing steam. Boiler or steam generator does not include water heaters, any waste heat recovery boiler that is used to recover sensible heat from the exhaust of a combustion turbine, nor does it include equipment associated with a chemical

recovery cycle.

3. BTU: British thermal unit.

4. Gas-Fired: Using natural gas, propane, or any other gaseous fuel for firing the boiler or steam generator.

5. Heat Input: The chemical heat released due to fuel combustion in a boiler, using the higher heating value of the fuel. This does not include the sensible heat of incoming combustion air.

6. Higher Heating Value: The heat liberated per mass of fuel burned (BTU) per pound, when fuel and dry air at standard conditions (68 degrees F and one atmosphere pressure) undergo complete combustion and all resultant products are brought to their standard states at standard conditions.

7. Oxides of Nitrogen Emissions: The sum of nitric oxide (NO) and nitrogen dioxide (NO_2) in the flue gas, collectively expressed as nitrogen dioxide.

8. Process Heater: Any combustion equipment fired with liquid, gaseous, or solid fuel and which transfers heat from combustion gases to water or process streams. A process heater does not include any kiln, furnace, recovery furnace, or oven used for drying, baking, heat treating, cooking, calcining, vitrifying or chemical reduction.

9. Rated Heat Input Capacity: The heat input capacity specified on the nameplate of the combustion unit. If the unit has been permanently altered or modified such that the maximum heat input is different than the input capacity specified on the nameplate and this alteration or modification has been approved in writing by the Air Pollution Control Officer (APCO), then the new maximum heat input shall be considered as the rated heat input capacity.

10. Reasonably Available Control Technology (RACT): The lowest emission limitation that a particular source is capable of meeting by the application of control technology that is reasonably available considering technological and economic feasibility.

11. Unit: Any boiler, steam generator or process heater as defined in this definition Section.

E. Requirements:

1. No later than one year following District adoption of this Rule, all existing units with a rated heat input capacity greater than or equal to 5 million BTU per hour shall demonstrate final compliance with the following Reasonably Available Control Technology (RACT) emission limitations dependent upon the specific

fuel fired in the unit and based upon a three-hour averaging period. All new units shall comply with the requirements of District Rule 2:3A - New Source Review.

EMISSION LIMITS FOR OXIDES OF NITROGEN (AS NO2)

Gaseous only fuel firing	Gaseous & Non-gaseous fuel co-firing firing	Liquid or Solid fuel
0.084 lbs/MMBTU or 70 ppmv	Heat input weighted average fuel limits	0.15 lbs/MMBTU or 115 ppmv

2. The owner or operator of any unit(s) with a rated heat input capacity less than 5 million BTU per hour shall submit for the approval of the Air Pollution Control Officer a list of all units operating within the District boundaries and a selection of one of the following four options to be added as a permit condition to the Permit to Operate for each such unit in order to achieve compliance with this rule:

   a. Operate in a manner that maintains stack gas oxygen concentrations at less than or equal to 3% by volume on a dry basis for any 15 consecutive minute averaging period; or

   b. Operate with a stack gas oxygen trim system set at 3% by volume oxygen. The operational tolerance of the setting shall be within the range of 2.85% to 3.15%; or

   c. Tune the unit at least once per year by a technician that is qualified to the satisfaction of the Air Pollution Control Officer to perform a tune-up in accordance with the procedure described in Attachment 1; Note: The owner/operator of any unit(s) is required to submit an annual report verifying that the tune-up has been performed. The report shall contain any other information or documentation that the Air Pollution Control Officer determines to be necessary, or

   d. Operate in compliance with the emission limits specified in Section E.1. of this rule.

3. Emissions from units subject to this rule shall not exceed a carbon monoxide concentration of 400 parts per million by volume when using only gaseous or a combination of gaseous and liquid fuels. Solid fuel-fired units shall not exceed carbon monoxide limits expressed in permit to operate conditions.

4. No person shall allow the discharge into the atmosphere from any emission control device installed and operated pursuant to the requirements of Section E. of this Rule, ammonia (NH_3) emissions in excess of 20 ppm by volume at dry stack conditions adjusted to 3% oxygen unless compliance with this requirement

is deemed to be technically or economically infeasible by the APCO due to fuel type, boiler configuration, or any other design characteristic of the unit.

F. Compliance Determination:

1. An owner or operator of any unit(s) shall have the option of complying with either the pounds-per-million-BTU emission rates or parts-per-million-by-volume emission limits specified in Section E.1. of this Rule. Periodic demonstration of compliance with this Rule with respect to emission limitations shall be once every two (2) years or 8,760 hours of actual operation, whichever occurs more frequent.

   a. Test methods pursuant to Section G.1. of this Rule shall not be required if a continuous emissions monitoring system (CEMS) is used to determine compliance with the parts-per-million-by-volume requirements of Section E.1. of this Rule. A Relative Accuracy Test Audit (RATA) shall be performed annually on the CEMS pursuant to Title 40 Code of Federal Regulations (40 CFR) Part 60 Appendix B-Performance Specifications 2. and 3.

2. All emission determinations shall be made in the as found operating condition at the maximum firing rate allowed by the district permit, and no compliance determination shall be established within two hours after a continuous period in which fuel flow to the unit is zero, or shut off, for 15 minutes or longer.

3. All ppmv emission limits specified in Section E. of this rule are referenced at dry stack-gas conditions and corrected to 3% by volume stack gas oxygen.

   Emission concentrations shall be corrected to 3% oxygen as follows:

$$[ppm]_{corrected} = \frac{20.95\% - 3.00\%}{20.95\% - [\%O2]_{measured}} * [ppm]_{measured}$$

4. All emission concentrations and emission rates shall be calculated or obtained from continuous emission monitoring data, or obtained by utilizing the test methods specified in Section G. Test Methods of this Rule.

G. Test Methods:

1. Compliance with the emission requirements in Section E.1. shall be determined using the following test methods:

   a. Oxides of Nitrogen - EPA Method 7E or ARB Method 100

   b. Carbon Monoxide - EPA Method 10 or ARB Method 100

c. Stack Gas Oxygen - EPA Method 3A or ARB Method 100

d. NOx Emission Rate (Heat Input Basis) - EPA Method 19

e. If certification of the higher heating value (HHV) of the fuel is not provided by a third party fuel supplier, it shall be determined by EPA Method 19.

2. For determination of the NH_3 concentrations in stack gases, Bay Area Air Quality Management District (BAAQMD) Source Test Procedure ST-1B, "Ammonia, Integrated Sampling" shall be utilized for stack sampling and EPA Method 350.3, "Ion Specific Electrode," shall be utilized as the analysis method(Reference EPA 600/4-79-020).

a. Alternate methods may not be used without prior approval of the Air Pollution Control Officer and, the California Air Resources Board and United States Environmental Protection Agency.

H. Recordkeeping Requirements:

1. Any persons subject to the provisions of Subsection E.1. of this rule shall install no later than one year following District adoption of this rule a totalizing fuel meter for each applicable unit that fires gaseous and/or liquid fuel. The meter shall be used to demonstrate that each unit operates at or below the applicable emission limitation.

2. Meters shall be accurate to ± one (1) percent, as certified by the manufacturer in writing. Meter readings shall be recorded at the end of each operating day in units of either cubic feet per day or gallons per day. At the end of each month, daily records shall be compiled into a monthly report. Both, monthly reports and daily records shall be maintained for a period of four (4) years and shall be made available for inspection by the Air Pollution Control Officer upon request.

3. Any person subject to the provisions of Subsection E.1. of this rule who fires a solid fuel in an applicable unit shall provide a means of calculating or verifying fuel input to the unit in lbs/hr that is acceptable to the Air Pollution Control Officer for purposes of documenting compliance with the specified emission limit.

Attachment 1

Tuning Procedure[1]

A. Nothing in this Tuning Procedure shall be construed to require any act or omission that would result in unsafe conditions that would be in violation of any regulation or requirement established by Factory Manual, Industrial Risk Insurors, National Fire Prevention Association, the California Department of Industrial Relations (Occupational Safety and Health Division), the Federal Occupational Safety and Health Administration, or other relevant regulations and requirements.

1. Operate the unit at the firing rate most typical of normal operation. If the unit experiences significant load variations during normal operation, operate it at its average firing rate.

2. At this firing rate, record stack gas temperature, oxygen concentration, and CO concentration (for gaseous fuels) or smoke-spot number[2] (for liquid fuels), and observe flame conditions after unit operation stabilizes at the firing rate selected. If the excess oxygen in the stack gas is at the lower end of the range of typical minimum values[3], and if CO emissions are low and there is no smoke, the unit is probably operating at near optimum efficiency -- at this particular firing rate. However, complete the remaining portion of this procedure to determine whether still lower oxygen levels are practical.

3. Increase combustion air flow to the unit until stack gas oxygen levels increase by one to two percent over the level measured in Step 2. As in Step 2, record the stack gas temperature, CO concentration (for gaseous fuels) or smoke-spot number (for liquid fuels), and observe flame conditions for these higher oxygen levels after boiler operation stabilizes.

4. Decrease combustion air flow until the stack gas oxygen concentration is at the level measured in Step 2. From this level gradually reduce the combustion air flow, in small increments. After each increment, record the stack gas temperature, oxygen concentration, CO concentration (for gaseous fuels) and smoke-spot number (for liquid fuels). Also, observe the flame and record any

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[1] **This tuning procedure is based on a tune-up procedure developed by KVB, Inc. for EPA.**

[2] **The smoke-spot number can be determined with the ASTM Test Method D-2156 or with the Bacharach methods. The Bacharach method is included in a tune-up kit that can be purchased from the Bacharach Company.**

[3] **Typical minimum oxygen levels for boilers at high firing rates are:**
1) For natural gas: 0.5 - 3%
2) For liquid fuels: 2 - 4%

changes in its condition.

5. Continue to reduce combustion air flow stepwise, until one of these limits is reached:

   a. Unacceptable flame conditions -- such as flame impingement on furnace walls or burner parts, excessive flame carryover, or flame instability.

   b. Stack gas CO concentrations greater than 400 ppm.

   c. Smoke at the stack.

   d. Equipment-related limitations -- such as low windbox/unit pressure differential, built in air-flow limits, etc.

6. Develop an O_2/CO curve (for gaseous fuels) or O_2/smoke curve (for liquid fuels) similar to those shown in Figures 1 and 2 using the excess oxygen and CO or smoke-spot number data obtained at each combustion air flow setting.

7. From the curves prepared in Step 6, find the stack gas oxygen levels where the CO emissions or smoke-spot number equal the following values:

FUEL	MEASUREMENT	VALUE
Gaseous	CO emissions	400 ppm
#1 and #2 Oils	Smoke-spot number	number 1
#4 Oil	Smoke-spot number	number 2
#5 Oil	Smoke-spot number	number 3
Other Oils	Smoke-spot number	number 4

   a. The above conditions are referred to as the CO or smoke thresholds, or as the minimum excess oxygen levels.

   b. Compare this minimum value of excess oxygen to the expected value provided by the combustion unit manufacturer. If the minimum level found is substantially higher than the value provided by the combustion unit manufacturer, burner adjustments can probably be made to improve fuel and air mix, thereby allowing operations with less air.

8. Add 0.5 to 2.0 percent to the minimum excess oxygen level found in Step A.7. and reset burner controls to operate automatically at this higher stack gas oxygen level. This margin above the minimum oxygen level accounts for fuel variations, variations in atmospheric conditions, load changes, and nonrepeatability or play in automatic controls.

9. If the load of the combustion unit varies significantly during normal operation, repeat Steps 1-8 for firing rates that represent the upper and lower limits of the range of the load. Because control adjustments at one firing rate may affect conditions at other firing rates, it may not be possible to establish the optimum excess oxygen level at all firing rates. If this is the case, choose the burner control settings that give best performance of firing rates. If one firing rate predominates, settings should optimize conditions at that rate.

10. Verify that the new settings can accommodate the sudden changes that may occur in daily operation without adverse effects. Do this by increasing and decreasing load rapidly while observing the flame and stack. If any of the conditions in Step A.5. result, of excess oxygen at the affect firing rates. Next, verify these new settings in a similar fashion. Then make sure that the final control settings are recorded at steady-state operating conditions for future reference (Refer to Figure 1 and Figure 2).

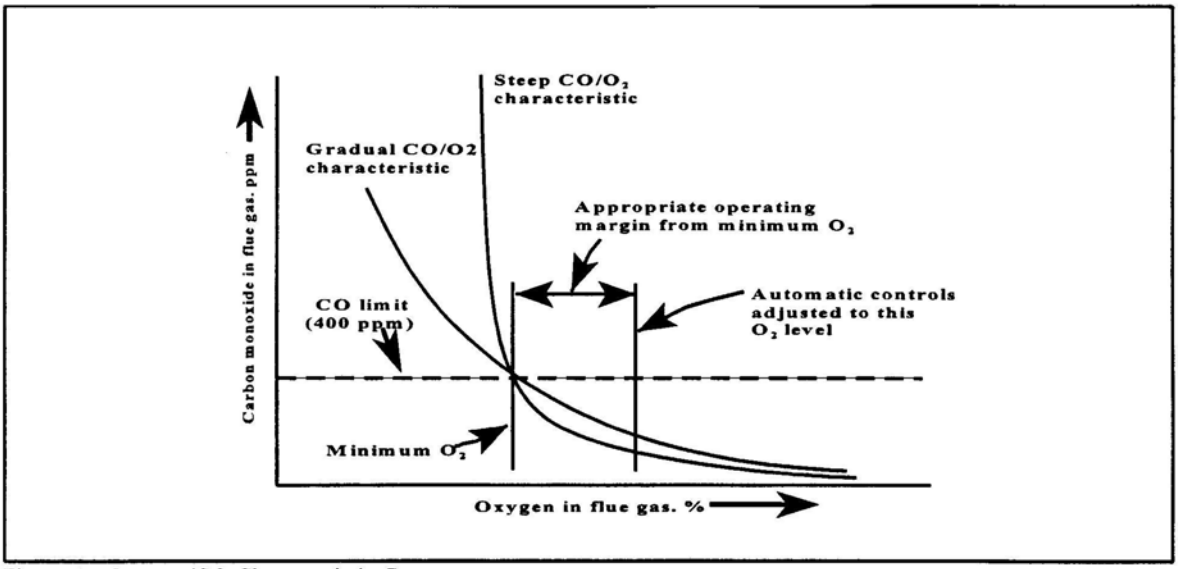

Figure 1: Oxygen/CO Characteristic Curve

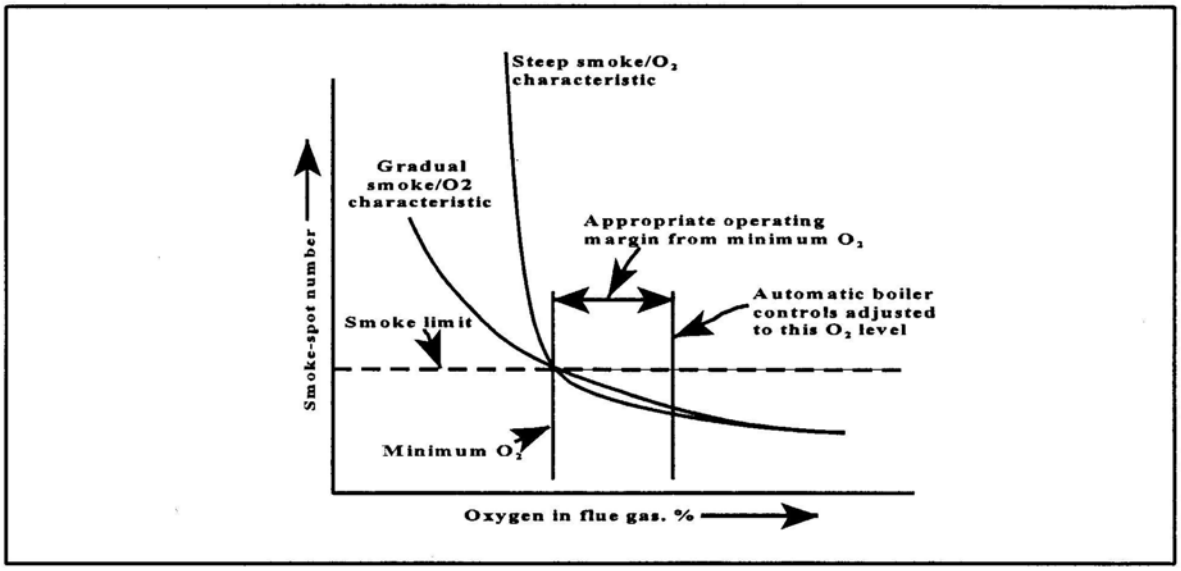

Figure 2: Oxygen/Smoke Characteristic Curve